

BOD Test Requirements Tim Loftus

Legend has it that the 5-day BOD (Biological Oxygen Demand) test was developed in England. Sewage was dumped in a river and it took five days for it to reach the ocean, hence the five-day incubation requirement in the BOD method.

Obviously, the BOD test is not the most scientifically based test we perform. As such, it has many problems associated with it. The most significant problem is that the results come five days after the fact. By that time you've already discharged any problem wastewater. Then the variability of the seed must be constantly monitored. Sometimes the bacteria wants to work, sometimes they don't. Again, by the time you find out, it is five days too late. Some analysts support the use of respirometry to give more timely results, but regulatory agencies have not fully accepted the methods yet so NPDES permits continue to specify that we perform the standard 5-day BOD test.

There is no absolute BOD value of a sample as there would be for say copper or lead. BOD results are test defined. In other words, BOD values are based on the parameters of the test method, not on any "true" BOD value. Below are the requirements that must be met for a BOD analysis to be valid (i.e. be in a form that can be used to compare BOD values with other sources). By meeting these requirements, it means that you have the method correct. It does not cover the additional problems of sample toxicity or errant dilutions. For information on how to set up and calculate a BOD analysis, refer to Standard Methods for the Examination of Water and Wastewater, 18th edition.

The BOD blank (a BOD bottle full of dilution water containing only the required nutrients, but not any seed) must not show a DO, or dissolved oxygen, depletion of more than 0.2 mg/L after the five day incubation period. A drop of more than 0.2 mg/L indicates some type of contamination or calibration error.

The seed, or the microorganisms added to industrial wastes or disinfected wastewater effluent samples to break down the organic compounds, should contribute 0.6 to 1.0 mg/L DO uptake per BOD bottle.

A glucose-glutamic acid standard, made according to Standard Methods, should produce a BOD result of 198 mg/L +/- 30.5. However, it's best to determine your own average and standard deviation so you can develop a more accurate and useful range and control chart.

Ideally, sample dilutions should show about a 50% DO decrease after the 5-day incubation period. At a minimum, there should be at least a 2.0 mg/L DO change between the initial and the final reading. There should also be a residual DO of at least 1.0 mg/L.

The blank, seed determination and glucose-glutamic acid standard should be run every time a BOD analysis is performed. If any of these basic BOD requirements are not met, then the test is considered invalid and remedial action is needed.

It's important to keep accurate records of these measurements so that you can monitor trends. You may find, for example, that seed viability changes with the seasons. Knowing this, adjustments in the amount of seed added to each bottle can be made to meet the 0.6 to 1.0 mg/L seed uptake requirement.

For all its shortcomings, the 5-day BOD test is here for a while. It has a lot of variability and must meet a number of requirements to be valid. However, it is possible to consistently meet these requirements, but it takes work and careful monitoring of everything that goes into the analyses.

The information in this article is based on an EPA accepted test method for NPDES monitoring. As usual, check your federal, state, and local regulations. You may have additional regulations or reporting requirements that you must meet.

This article was written under the auspices of the New England Water Environment Association (a chapter of the Water Environment Federation) Laboratory Practices Committee. Please visit the NEWEA website at www.newea.org for membership information and other opportunities.